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Differentiable Modal Synthesis for Physical Modeling of Planar String Sound and Motion Simulation

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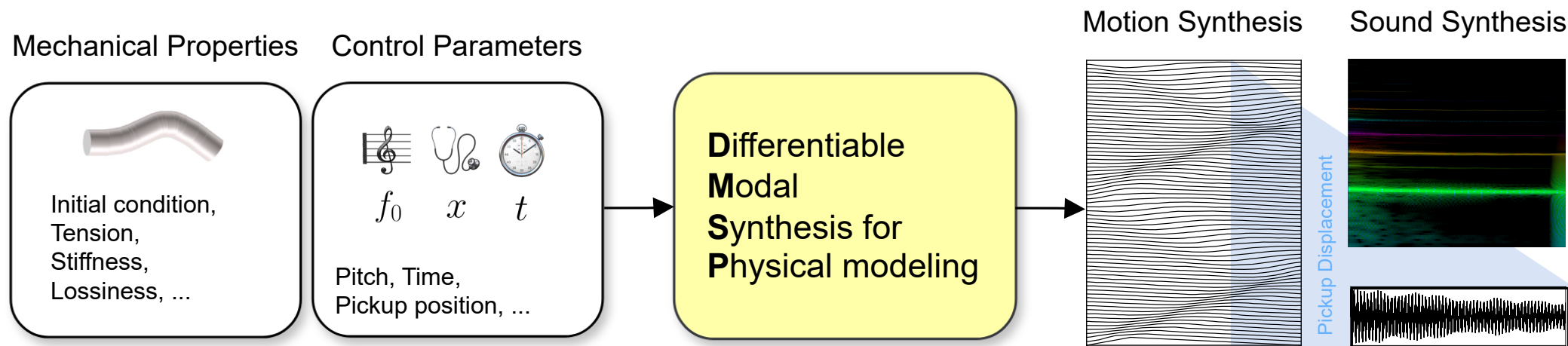
Differentiable Modal Synthesis for Physical Modeling of Planar String Sound and Motion Simulation

- Differentiable Modal Synthesis for Physical Modeling (DMSP)
 - Nonlinear Plucked String Simulation using Neural Network
 - Nonlinearities:
 - Pitch glides (tension modulation)
 - Phantom partials (inharmonicities)
 - Dynamic control
 - Time-varying pitch/stiffness/tension/...



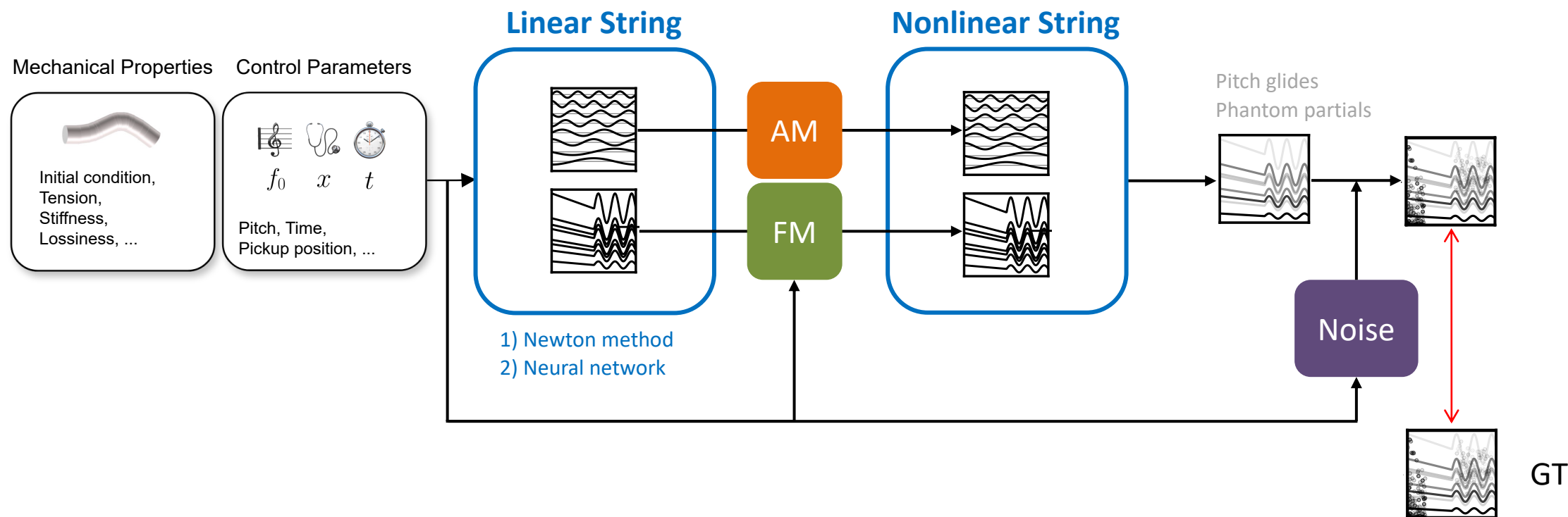
Differentiable Modal Synthesis for Physical Modeling of Planar String Sound and Motion Simulation

- Differentiable Modal Synthesis for Physical Modeling (DMSP)
 - Nonlinear Plucked String Simulation using Neural Network
 - Differentiable Spectral Modeling Synthesis + Modal Decomposition



Differentiable Modal Synthesis for Physical Modeling of Planar String Sound and Motion Simulation

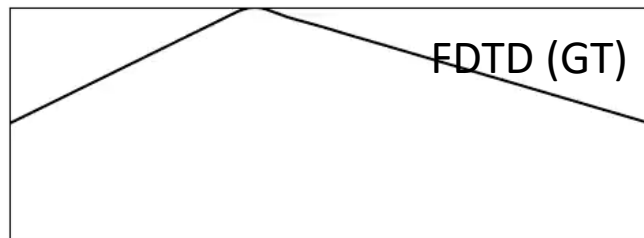
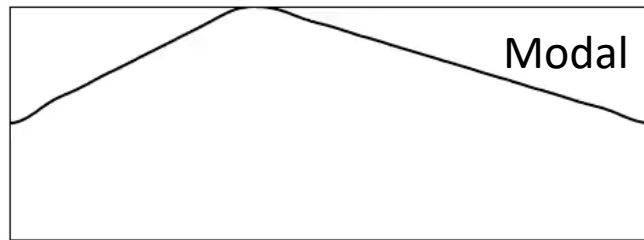
▪ Differentiable Modal Synthesis for Physical Modeling (DMSP)



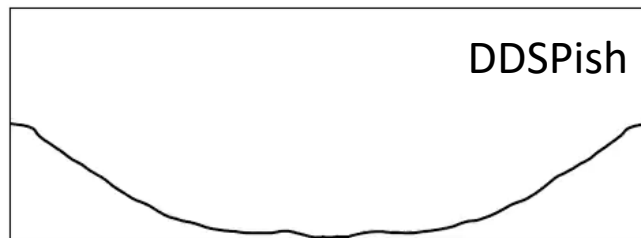
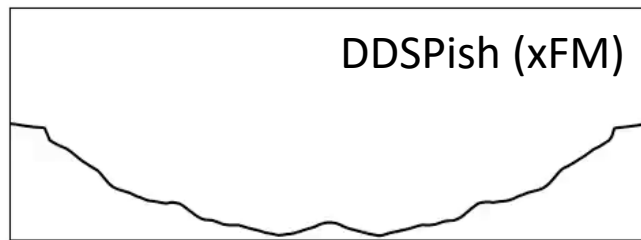
Differentiable Modal Synthesis for Physical Modeling of Planar String Sound and Motion Simulation

- Synthesized Motions (with Sounds)

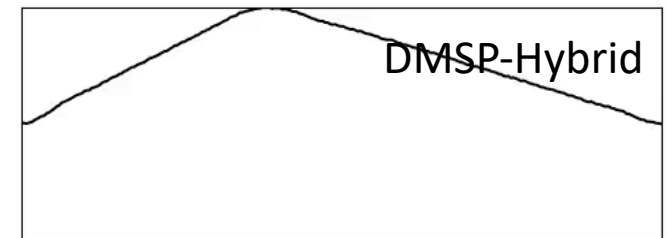
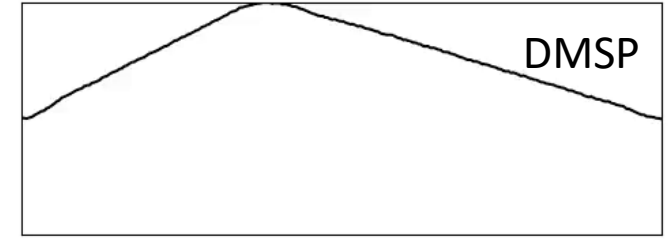
Simulated



NN Baselines



Ours



Key Takeaways

Temporal Duration

Spatial Resolution
Reduce to simulate faster. Recommended to leave it as 256.

Pitch
Specify the fundamental frequency as a musical note.

Glissando
Set +/- to ascend (+) or descend (-) the pitch

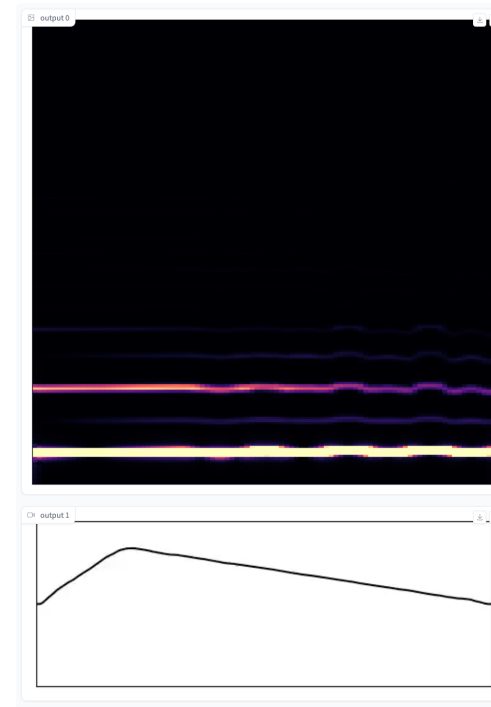
Vibrato
Set larger value to add more vibrato

Stiffness
Stiffness can change the resulting pitch. Specify low values when tension is high

Stiffness-Tension Ratio
Tension can introduce non-linear effects such as pitch glide. Specify low values when stiffness is high

Plucking Position
Peak position of an initial condition

Plucking Amplitude
Peak amplitude of an initial condition



<https://huggingface.co/spaces/szin94/dmsp>

